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A MIRROR OPERATING MECHANISM

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(57)

This invention describes a mirror operating mechanism for rotating a mirror head from a deployed position to a parked position. The mirror head (12) is mounted to a mirror mounting bracket (10) via a spigot (11) on the mounting bracket. The mirror head (12) is supported on a mounting bracket (10) for rotation with respect to the spigot (11). At least one detent (17) is placed between the mirror mounting bracket (10) and the mirror head (12) to hold the mirror head (12) in the required position. Resilient means (23) acts between the mirror mounting bracket (10) and the mirror head (12) with respect to the detent (17) so that the detents (17) are held in engaged positions. Drive means is operatively coupled to the spigot (11) to cause the mirror head (12) to rotate with respect to the spigot (11). The drive means includes an actuator (56, 50 or 92) that is moved upon initial operation of the drive means while the detents (17) resist rotation of the mirror head (12). The actuator (56, 50 or 92) movement applies a force to the resilient means (23) to in turn compress it and to allow movement of the mirror head (12) so that the detents (17) may disengage to thereby allow rotation of the mirror head (12) by the drive means. The advantage of the invention is that the drive means does not require excessive force to disengage the detents (17). This results from the operating mechanism first disengaging the detent (17) before requiring the drive means to rotate the mirror head (12).

to or from a parked position, the motor will be prevented from stalling by release of the clutch.

Preferably, the clutch comprises a spring bearing against the static gear and a clutch detent beneath the gear wheel that provides sufficient holding force for normal operation of the operating mechanism, but which releases when sufficient force is applied to the mirror head.

During disengagement of the detents in respect of both vertical and transverse movement of the mirror head, there will be a slight amount of rotation of the mirror head as the force applied to the detent is relieved. This will be due to the gradual outward movement of the mirror head and the corresponding readjustment of the detent position.

DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will now be described, but it should be realised that the scope of the invention is not to be limited to these specific details of the these embodiments. Five embodiments are illustrated in the accompanying drawings:

Fig1 shows a cross-sectional view of a mirror operating mechanism about cross-section line 1-1 of Fig 3 and shows the dotted outline of a mirror bracket and mirror head,

Fig 2 shows the same cross-sectional view of a mirror operating mechanism illustrated in Fig 1, but at a larger scale,

Fig 3 shows a cross-sectional view of a mirror operating mechanism along cross-section line 3-3 of Fig 2,

Fig 4 shows an exploded view of components assembled around the spigot of the mirror bracket,

Fig 5 shows an exploded view of a retainer gear wheel and lifting plate,

Fig 6 shows a cross-sectional view of a second embodiment of the invention,

Fig 7 shows a cross-sectional view of a third embodiment of the invention,

Fig 8 shows a cross-sectional view of a fourth embodiment of the invention,

Fig 9 shows a part cross-sectional side view of a fifth embodiment of the invention,

Fig 10 shows a part plan cross-sectional view of a fifth embodiment according to the invention, and

Fig 11 shows the same part cross-sectional plan view shown in Fig 10 but with detents partly disengaged.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

A first embodiment is illustrated in Figs 1 to 5. A mirror mounting bracket 10 is secured to the side of a motor vehicle. Attached to the mirror mounting bracket 10 is a spigot 11. The spigot 11 has a vertical axis, and the mirror head 12 is mounted so that it rotates about the vertical axis of the spigot 11. The main result to be achieved by the invention is to rotate the mirror head 12 from a deployed position to a parked position where the mirror head 12 is substantially parallel to the side of the vehicle with the mirror glass of the mirror head 12 against the vehicle body. Preferably, this occurs through either operation of a manual control, or as the ignition is turned off. The invention also redeploys the mirror upon either operation of a manual control or the ignition being turned on.

In this embodiment, the spigot 11 is tubular, and is held to the mirror mounting bracket 10 via threaded fasteners 13.

Part of the mirror operating mechanism shown in this embodiment is contained within a casing 14 which in turn is secured to the mirror head 12. The casing 14 has a cylindrical bearing surface 15 which is journalled to the external surface of the spigot 11. This enables the casing 14 and attached mirror head 12 to rotate with respect to the spigot 11.

Detents 17 are provided between the casing 14 and the spigot 11. In this embodiment, the detents 17 comprise three projections 18 on the base of the spigot 11, and corresponding recesses 19 in the base of the casing 14. The projections 18 and the recesses 19 have angled surfaces 20 and 21 which assist in disengagement of the

detent as the casing 14 rotates with respect to the spigot 11. The projection 18 does not fully engage within the recess 19. This ensures that the lower surface of the casing 14 does not abut against the base of the spigot 11. This results in positive engagement of the detents, which in turn resists any relative rotation of the casing 14 with respect to the spigot 11.

The tubular spigot 11 enables some of the components to be located within the spigot 11. In this embodiment, a tube 22 is located within the spigot 11 so that the axis of the tube 22 is coaxial with the axis of the spigot 11. In this embodiment, the resilient means comprises a coil spring 23 that is located on the outer surface of the tube 22. The tube 22 has a flange 24 at its lower end against which the lower end of the spring 23 abuts.

The tube 22 extends beyond the upper end of the spigot 11. A gear wheel 25 is journalled to the tube 22. The gear wheel 25 sits above the upper end of the spigot 11, and has a flange 26 positioned between it and the spigot 11. The flange 26 is part of the casing 14. The gear wheel 25 abuts against the upper edge of the flange 26. A retainer 29 is held at the end of the tube 22. The retainer 29 is also prevented from rotating with respect to the tube 22.

The spring 23 pushes the tube 22 downwardly so that the retainer 29 applies a force to the upper surface of the gear wheel 25. This in turn forces the gear wheel 25 on to the flange 26 which in turn forces the casing 14 downwardly with respect to the spigot 11. In this way, the spring 23 transfers its force to the detents at the base of the spigot 11.

Referring to Figs 2 and 3, the casing 14 houses an electric motor 30 which in turn drives a drive gear assembly. The drive gear assembly comprises a worm drive 31 that is attached directly to the electric motor 30. The worm drive 31 in turn drives a reduction gear assembly which comprises a first gear 32 and a smaller second gear 33. The first and second gears 32 and 33 have a common axle 34 that is journalled within the casing 14. A further reduction gear assembly is provided which

comprises a third gear 35 combined with a worm drive 36. The third gear and worm gear 35 and 36 have a common axis 37 and are journalled within the casing 14. The second gear 33 meshes with the third gear 35, and causes rotation of the worm drive 36. The worm drive 36 engages the gear wheel 25.

When the detents 17 are engaged, operation of the motor 30 and associated gear drive will cause the worm drive 36 to attempt to rotate gear wheel 25. When the detents 17 are disengaged continued operation of the electrical motor 30 will result in the gear wheel 25 remaining stationary which will then result in the worm drive 36, and consequently the casing 14 and attached mirror head 12, rotating around the gear wheel 25 and spigot 11. Further details of this operation will be described below.

Figs 4 and 5 best show a lifting plate 40 and a clutch plate 41. The lifting and clutch plates 40 and 41 are located in the end of the tubular spigot 11. The lifting plate 40 in combination with the gear wheel 25 comprise the actuator that provides the upward movement of the gear wheel 25 upon initial operation of the electric motor. The clutch plate 41 enables breakaway of the mirror head should some form of external force be applied to the mirror head either with or without the electric motor 30 operating. The upper end of the spigot tube 11 has a ledge 43 about which the lifting and clutch plates 40 and 41 are journalled for rotation.

The lifting plate 40 has a ring portion 45 that locates within a circular recess in the upper end of the spigot 11 so that the ring 45 sits on ledges 43. The underneath surface of ring 45 has three circular ridges 46 that abut against the inner periphery of ledges 43.

The upper surface of the ring 45 is provided with three projections 47. Each projection comprises a second ramp surface 50, a first vertical surface 51 and second vertical surface 52.

The gear wheel 25 has three projections 55 that locate within the space between the projections 47 on the lifting plate 40. The projections 55 have first ramped surfaces 56 which abut against the second ramped surfaces 50 and vertical surfaces 57. There is some clearance between the projections 55 and the ring 45 to ensure that the gear wheel 25 always rests against the flange 26 of the casing 14.

The lifting plate 40 is normally held with respect to the spigot 11. Upon initial operation of the electric motor 30, the worm drive 36 causes the gear wheel 25 to rotate slightly with respect to the lifting plate 40. Continued rotation of the gear wheel 25 causes sliding engagement of the first and second ramped surfaces 55 and 50, which causes a vertical lifting motion of the gear wheel 25. This is resisted by the spring 23, but this resistance is less than the engaging force provided by the detents 17. This results in continued lifting of the gear wheel 25 until it is sufficiently raised above the flange 26 to enable vertical movement of the mirror head and disengagement of the detents 17. Once the detents 17 are disengaged, the force required to lift the gear wheel 25 against the spring 23 is greater than the force required to rotate the mirror head 12 so that continued operation of the worm drive 36 will cause it to drive itself around the periphery of the stationary gear wheel 25. The consequence of this is that the casing 14 and attached mirror head 12 will rotate about the spigot.

The embodiment shown in Figs 1 to 5 is for an operating mechanism used with a right-hand mirror. The gear wheel 25 shown in this embodiment has a pair of first ramp surfaces 56 either side of projections 55 so that it may be used for either left-hand or right-handed mirrors. Obviously, a left-hand lifting plate 40 would be required with the second ramp surfaces 50 on the opposite side of the projections 47 as shown in this embodiment.

The clutch plate 41 is held between the spring 23 and the underneath surface of ledges 43. Each of the ledges 43 locate within recesses 58 in the clutch plate 41. The underneath surfaces of the ledges 43 and the recesses 58 comprise the clutch detent. The lifting and clutch plates 40 and 41 are restrained from rotating relative to one

another, the lifting plate 41 is journalled for rotation about tube 22 and the clutch plate 41 is able to slide longitudinally along the tube 22.

The tube 22 is provided with three longitudinal channels 61 that are radially spaced around the surface of the tube 22. Each of the channels 61 extends right to the upper end of the tube 22. To restrain relative rotation of the clutch plate 41 with respect to the tube 22, it has three lugs 62 that engage respective channels 61. The tube 22 is slid into position through the centre of the clutch plate 41. The engagement of the lugs 62 in the channels 61 does enable the clutch plate 41 to slide axially along the tube 22.

The clutch plate 41 has three posts 59 which locate within recesses 60 of the lifting plate 40. Engagement of the posts 59 within the recesses 60 prevent the clutch plate 41 rotating with respect to the lifting plate 40, but does enable a degree of axial separation of the clutch plate 41 with respect to the lifting plate 40 while maintaining engagement between the posts 59 with the recesses 60.

The clutch plate 41 has three radial recesses 63 in its peripheral portion. The internal surface of the spigot 11 has three longitudinal ribs 64 that are engaged by the radial recesses 63. This enables the clutch plate 41 to be inserted into the spigot 11 from its base. The longitudinal ribs 64 do not extend for the full height of the spigot 11, and when the radial recesses 63 disengage from the end of the ribs 64, the clutch plate 41 can be rotated so that the recesses 58 engage the ledges 43. The pitch circle diameter of the outer surface of the post 59 locates within the inner diameter of the projections 43. This enables the clutch plate 41 and posts 59 to fully rotate with respect to the spigot 11 when the clutch plate 41 moves downwardly so that the ledges 43 disengage from the recesses 58.

In this embodiment, the retainer 29 also comprises a helper plate where the retainer 29 three third ramped surfaces 66 that engage with fourth ramped surfaces 67 on the gear wheel 25. The direction of inclination of the third and fourth ramped surfaces 66 and 67 is the same as the first and second ramped surfaces 56 and 50 however the

degree of inclination of the third and fourth ramped surfaces 66 and 67 with respect to the horizontal is less than the degree of inclination of the first and second ramped surfaces 56 and 50. This ensures that some assistance is provided to raise the gear wheel 25 by relative movement between the third and fourth ramped surfaces 66 and 67 due to the downward pressure exerted by the spring 23, while at the same time providing sufficient downward force to allow the gear wheel 25 to lower with respect to the first and second ramped surfaces 56 and 50 when required. Obviously, if the angle of the third and fourth ramped surfaces 66 and 67 were the same as the first and second ramped surfaces 56 and 50, then there would be no net downward force applied to the gear wheel 25. By reducing the angle of the third and fourth ramped surfaces 66 and 67 with respect to the horizontal, then there will be a net downward acting force. This net downward force must be sufficient to overcome the frictional load between the various ramped surfaces.

The retainer 29 has a plurality of barbs 69 which engage within apertures 70 of the tube 22. The retainer 29 is pushed onto the end of the tube with lugs 71 engaging the channels 61. This prevents rotation of the retainer 29 with respect to the tube 22. The retainer 29 is pushed into place until the barbs 69 spring into the apertures 70. Due to the compression of the spring 23 an upward force is applied to the retainer 29 and the location of the barbs 69 within the aperture 70 holds the retainer 29 in position on the tube 22.

Upon the electric motor 30 being energised, the worm drive 36 will apply force to drive the gear wheel 25 in a clockwise direction. Movement of the worm drive 36 and casing 14 around the gear wheel 25 will be prevented by engagement of the detents 17. The force required to disengage the detents 17 at this stage will be in excess of the force required for the worm drive 36 to rotate the gear wheel 25 against the first and second ramped surfaces 56 and 50. As the worm drive 36 continues to drive the gear wheel 25, it will result in the first ramped surfaces 56 sliding along the second ramped surfaces 50. This will in turn cause lifting of the gear wheel 25. It will be lifting against the force of the spring 23.

Continued operation of the worm drive 36 will result in the gear wheel 25 lifting clear of the flange 26. This will result in the angled surfaces 20 of the detents 17 sliding with respect to one another which, together with the third and fourth ramped surfaces 66 and 67, provides some additional force that assists to compress the spring 23.

Obviously, a shallow angle of the first and second ramped surfaces 56 and 50, will require less force to rotate the gear wheel 25 against the spring 23. However, the disadvantage of a low angle is that lifting of the gear wheel 25 will occur quite slowly. Accordingly, a steeper angle for the first and second ramped surfaces 56 and 50 which provides a rapid lift of the gear wheel 25 is compensated through the force provided by the third and fourth ramped surfaces 66 and 67 and the angled surfaces 20 and 21 on the detents 17. This minimises the lifting load of the gear wheel 25 while at the same time ensuring that a rapid lift is achieved. This in turn means that less motor power is required, and a quiet and quick operation is achieved.

As the gear wheel 25 continues to lift, the detents 17 will reach a point where they can readily disengage. At this point, the force required to rotate the casing 14 and mirror head 12 with respect to the spigot 11 is less than required to lift the gear wheel 25. When this occurs, the gear wheel 25 will remain stationary, and the worm drive 36 will drive itself together with the casing 14 and mirror head 12 around the gear wheel 25. This obviously rotates the mirror head into a parked position. Operation of the motor 30 and therefore rotation of the mirror head 12 will continue until the mirror head reaches its parked position. At this point, further rotation of the mirror head 12 will be restrained, which will result in an increase in the current drawn by the motor. This current increase can be sensed and electronic controls provided to de-energise the motor 30.

When the electric motor 30 is energised again to move the mirror head 12 from a parked position to its deployed position, the motor 30 will again operate to rotate the gear wheel 25. Obviously, the direction of rotation of the electric motor 30 will be opposite to that used to park the mirror head 12. The initial rotation of the gear

wheel 25 will cause the vertical surfaces 57 on projections 55 of the gear wheel 25 to engage the second vertical surfaces 52 on the lifting plate 40. This will prevent further rotation of the gear wheel 25 which in turn will cause the worm drive 36 to move around the periphery of the gear wheel 25. This in turn causes rotation of the casing 14 and mirror head 12 to the deployed position. At the deployed position, the detent 17 will again re-engage, and the current drawn by the motor will increased, be sensed and result in the motor 30 being de-energised.

Should the mirror head 12 be forced either while the electric motor 30 is not operating or even when it is operating, the clutch plate 41 will disengage and allow free rotation of the mirror head 12. For example, if the mirror head 12 is pushed in either direction, then the vertical surfaces 57 on the gear wheel 25 will engage either the first or second vertical surfaces 51 or 52 depending on the direction that the mirror head 12 is rotated. This will then transfer the rotation force from the lifting plate 40 via the posts 59 to the clutch plate 41. Provided that this force is sufficient, then the clutch plate 41 will move downwardly with respect to the tube 22 and allow the ledges 43 to disengage from the recesses 58. This will then enable the combination of the clutch plate, the tube 22 which is rotationally secured to the clutch plate 41, the lifting plate 40 which is rotationally secured to the clutch plate 41, the gear wheel 25 which is restrained by engagement of the vertical surfaces 57 with either the first or second vertical surfaces 51 or 52 and the casing 14 to rotate freely with respect to the spigot 11. This will result in detents 17 disengaging.

In this manner, the mirror head 12 can be manually placed into the parked position. Through this means, the clutch plate 41 will be disengaged from the ledges 43. Upon further operation of the electric motor 30, the gear wheel 25 will rotate until the clutch plate re-engages with the ledges 43. This will then enable normal operation of the assembly.

If during operation of the motor 30, the mirror head 12 were to become jammed, such as coming up against an obstruction, then the worm drive 36 will stop rotating with respect to the spigot 11, and will in turn rotate the gear wheel 25 until the vertical

surfaces 57 come into contact with either the first or second vertical surface 51 or 52. The lifting plate 40 will then be driven by the gear wheel 25, and will turn, via the posts 59 drive the clutch plate so that the ledges 43 disengage from the recesses 58. Alternatively, the load required to disengage the ledges 43 from the recesses 58 may be such as to draw excessive current and cause the current sensing circuitry to de-energise the motor 30.

Fig 6 shows a second embodiment of the invention and differs from the first embodiment in that the clutch plate 41a is positioned above the gear wheel 25a. In this embodiment, the spigot 11 is secured to the mirror mounting bracket 10 via a threaded fastener 72. A single threaded fastener 72 is all that is required. The tube 22 and spring 23 are located within the tubular spigot 11. The lifting plate 40a is held beneath flanged fingers 73 at the end of spigot 11. This prevents longitudinal movement of the lifting plate 40a with respect to the spigot 11, but enables it to rotate. The spring 23 bears against the lower surface of the lifting plate 40a The gear wheel 25a is located above the lifting plate 40a, and the lifting plate 40a has a tubular extension 74a to which the gear wheel 25a is journalled.

The clutch plate 41a is located above the gear wheel 25a, and the engaging surfaces of the clutch plate 41a and gear wheel 25a perform the function of a helper plate. They are provided with third and fourth ramped surfaces 66 and 67 that assist in the upward movement of the gear wheel 25a. The tubular extension 74a has a castellated end which engages corresponding recesses within the clutch plate so that the clutch plate 41a is unable to rotate independently of the lifting plate 40a, but is able to move longitudinally with respect to the lifting plate 40a along the axis of the spigot 11.

The upper surface of the clutch plate 41a abuts against the lower surface of a retainer 29a. The upper surface of the clutch plate 41a is provided with a number of V-shaped projections 76 which locate within V-shaped recesses 77 within the retainer 29a. The retainer 29a is held on the end of the tube 22 so that it is not able to rotate or move longitudinally with respect to the tube 22.

Operation of the motor 30 will cause the gear wheel 25a to lift thereby relieving the downward load applied to the detent 17a. This will enable rotation of the mirror head 12 upon continued operation of the motor 30. The third and fourth ramped surfaces 66 and 67 will assist in the upward movement of the gear wheel 25a. Breakaway movement or jamming of the mirror head 12 will result in disengagement of the V-shaped recesses and projections 66, 67. In addition, if the mirror head 12 is moved from a parked position to its operating position manually, which results in disengagement of the V-shaped recess and projection 76 and 77, there will still be a force applied to the upper surface of the gear wheel 25a which in turn results in a load being applied to the detents 17a. This will enable positive relocation of the detent 17a upon manual outward movement of the mirror head 12.

A third embodiment is shown in Fig 7. In this embodiment, the main variation is that all of the elements are journalled to the external surface of the spigot 11. The lifting plate 40b is journalled on the external surface of the spigot 11, and has a tubular extension 74b. The gear wheel 25b is journalled to the external surface of the tubular extension 74b. The gear wheel 25b abuts against flanges 26. The clutch plate 41b is located above the gear wheel 25b. A clutch detent disc 79 is located above the clutch plate 41b. The spring 23b is located between the clutch detent disc 79 and a spring disc 80b. The spring disc 80b is secured to the spigot 11 so that the spring 23b applies a compressive load to the upper surface of the clutch detent disc 79 and in turn transfers force via the abutment of the gear wheel 25b on flanges 26 to the detents 17b.

This embodiment uses a minor modification in the gear drive in that a worm drive 82b is used to drive a reduction gear set 83b which in turn drives the gear wheel 25b.

As in the second embodiment, the tubular extension 74b has a castellated end which engages corresponding recesses within the clutch plate 41b. This prevents relative rotation between the lifting and clutch plates 40b and 41b but enables the clutch plate 41b to move with respect to the longitudinal axis of the spigot 11.

As with the second embodiment, the abutting surfaces between the clutch plate 41b and the gear wheel 25b are provided with third and fourth ramped surfaces 66 and 67, and the abutting surfaces between the upper surface of the clutch plate 41b and the clutch detent disc 79 are provided with V-shaped projection and recesses 76 and 77.

The actuator for lifting the gear wheel 25b is the same for both the second and third embodiment. The actuator comprises a first and second ramped surfaces 56 and 50 which are caused to slide with respect to one another upon initial operation of the electric motor 30. This results in an upward movement of the gear wheel 25b, a relieving of down load force on the detent 17b, and the resultant lifting of the casing 14 and mirror head 12. Once lifted sufficiently, the detent 17b will disengage, and the mirror head 12 will rotate in a manner similar to that described in respect of the first embodiment.

The operation of the first and second vertical surfaces 51 and 52 and the vertical surfaces 57 are the same as that described in the first embodiment.

As with the second embodiment, even if the V-shaped projection and recess 76 and 77 are disengaged, there will be a constant down load applied via the gear wheel 25b to the flange 26 which will enable positive relocation of the detent 17b should the mirror head 12 be manually returned to its operating position. This is also the case in respect of the first embodiment. This is an important safety feature, as it ensures that the detents 17 will re-engage if the mirror is manually moved to its deployed position.

A fourth embodiment is shown in Fig 8. This embodiment is a simpler assembly by comparison to the first three, but does have the disadvantage that when the clutch plate 41c is disengaged, no positive force will be applied to the detents 17c.

In this fourth embodiment, the clutch plate 41c is journalled to the external surface of the spigot 11. The gear wheel 25c is journalled to a tubular extension 74c of the

clutch plate 41c. The spring 23c operates between the upper surface of the gear wheel 25c and a spring disc 80c. The spring disc 80c is secured to the spigot 11, and results in the compressed spring 23c applying a force to the upper surface of the gear wheel 25c. The gear wheel 25c in turn abuts against flange 26 which in turn applies load to the detent 17c. In this embodiment, the detents are balls held in corresponding recesses.

In this embodiment, the clutch plate 41c is held between the base of the gear wheel 25c and the base of the spigot 11. The actuator is provide between the abutting surfaces of the lower portion of the gear wheel 25c and the upper surface of the clutch plate 41c, and comprises first and second ramped surfaces 56 and 50. Vertical surfaces 57 and 51 are provided at the end of the ramped surfaces 56 and 50 to restrain rotation of the gear wheel 25c with respect to the clutch plate 41c. Posts 85 located within corresponding recesses within the gear wheel 25c and abut against surfaces within the gear wheel 25c to prevent its rotation in the other direction. This enables any force applied to the mirror head 12 to transfer via the gear wheel 25c to the clutch plate 41c which then enables the V-shaped projection and recesses 76 and 77 to disengage.

The gear drive in this fourth embodiment again differs from the previous embodiments in that the electric motor 30 drives a worm drive 82c which in turn drives a first reduction gear set 83c that itself drives a second reduction gear set 84c. The second reduction gear set 84c in turn drives the gear wheel 25c.

A helper disc 86 sits on top of the gear wheel 25c, and has third and fourth ramped surfaces 66 and 67 on the base of the helper disc 86 and the top of the gear wheel 25c. In addition, the tubular extension 74c has a castellated end which engages apertures within the helper disc 86 to prevent relative rotation between the two components but to enable the helper disc 86 to move with respect to the clutch plate 41c.

A fifth embodiment is illustrated in Figs 9 and 11. This embodiment differs from the first to fourth embodiments in that instead of the mirror head 12 moving vertically

along the axis of the spigot 11, the mirror head 12 in this embodiment moves laterally with respect to the spigot 11. However, a similar operating principle applies in that the mirror head 12 is moved away from the detent 17 to allow disengagement.

In this embodiment, a housing 87 is pivotally mounted to the spigot 11. The mirror head 12 is in turn mounted to the housing 87 so that it may slide with respect to the housing 87 to disengage or re-engage the detents 17d. A coil spring 23d is placed between the mirror head 12 and the housing 87 which acts to push the mirror head 12 in a direction that engages the detents 17d.

In this embodiment, the detents comprise substantially V-shaped projections 88 that locate within V-shaped recesses 89.

The gear wheel 25d is journalled to the spigot 11. A second spring 91 is held between the upper surface of the gear wheel 25d and a spring disc 80d. A breakaway clutch comprises detent balls 90 that are located at the base of the gear wheel 25d.

A shaft 92 is slidably journalled in the housing 87. The shaft 92 is able to rotate about its axis as well as being able to move longitudinally along its axis. The shaft 92 is driven by an electric motor 30 which drives a gear 93 via a worm drive 82d. The shaft 92 has a worm drive 95 that engages the gear wheel 25d.

Initial operation of the electric motor 30 will cause the worm drive 95 to push to shaft 92 along its longitudinal axis so that the end 96 of the shaft 92 pushes against the mirror head 12. The gear 93 is sufficiently wide enough to ensure that it remains engaged with the worm drive 82. The shaft 92 is caused to move laterally due to the detents 17d being engaged and providing a resistive force to rotation of the worm drive 95 around the gear wheel 25d. Accordingly, the shaft 92 and associated worm drive 95 comprise an actuator which will move the mirror head 12 so as to compress the spring 23d and to disengage the detents 17d.

As with all the embodiments, the initial operation of the electric motor 30 will cause a combined movement where movement of the mirror head 12 will disengage the detent 17d which will result in some minor rotation of the mirror head 12 as the detent 17d progressively disengage. In other words, the drive means will cause rotation of the mirror head 12 to readjust for the changing positions of the detents 17d.

In the fifth embodiment, if the mirror head 12 is impacted or manually moved, then sufficient force will be applied to the clutch detents 90 to cause the gear wheel 25d to vertically lift against the spring 91. This will then enable the mirror head 12 to rotate freely with respect to the mirror mounting bracket 10.

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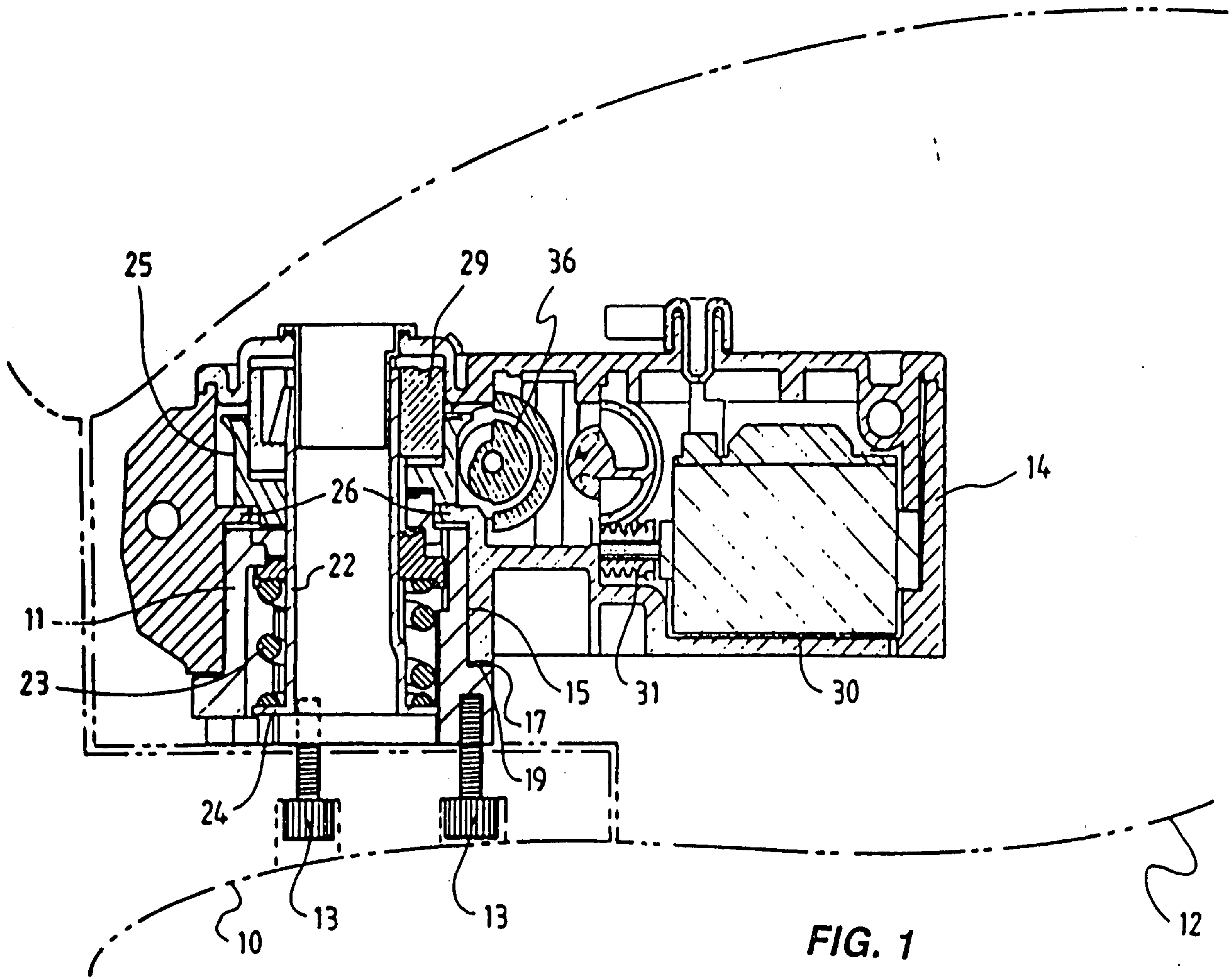

FIG. 1

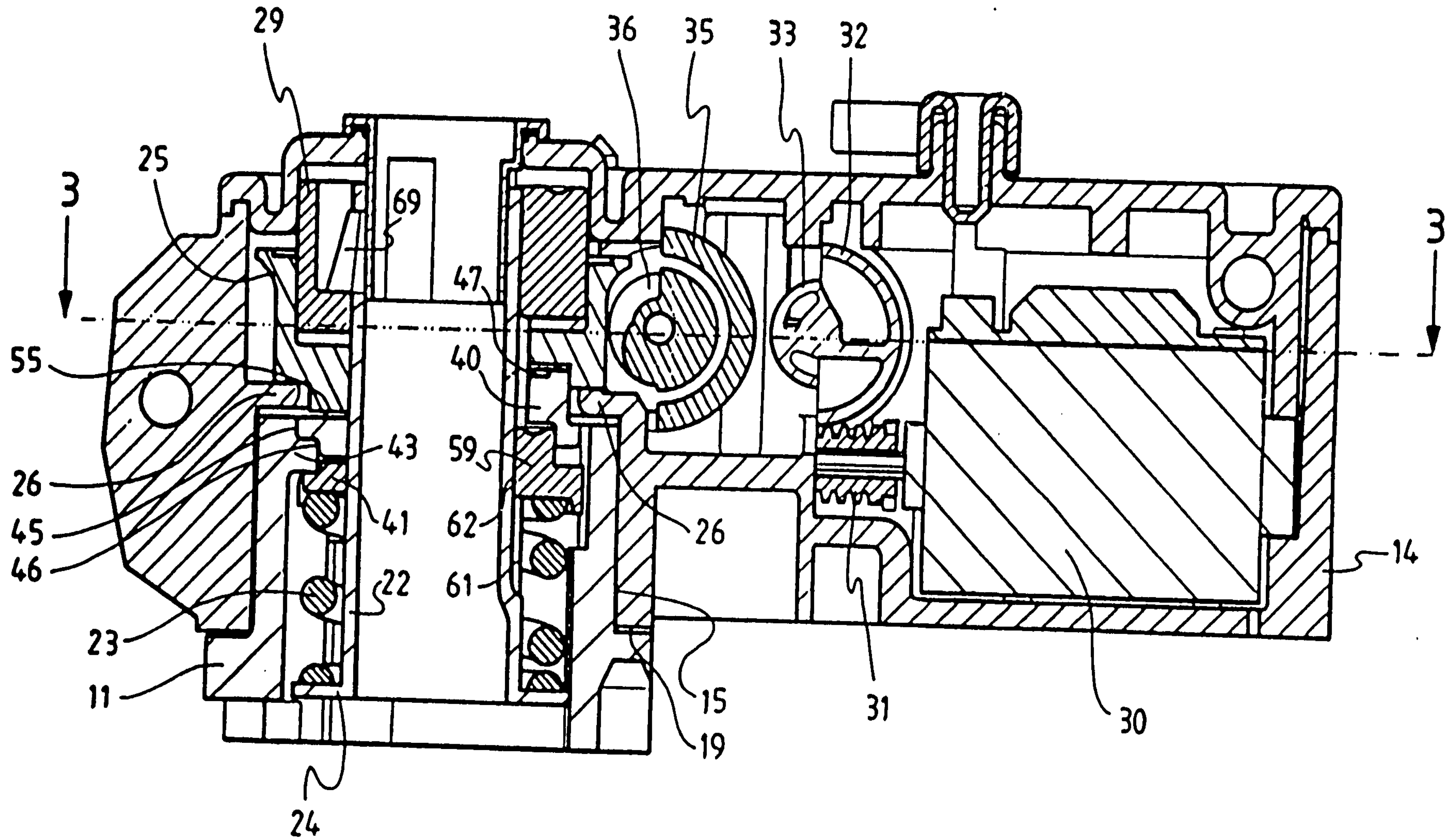
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FIG. 2

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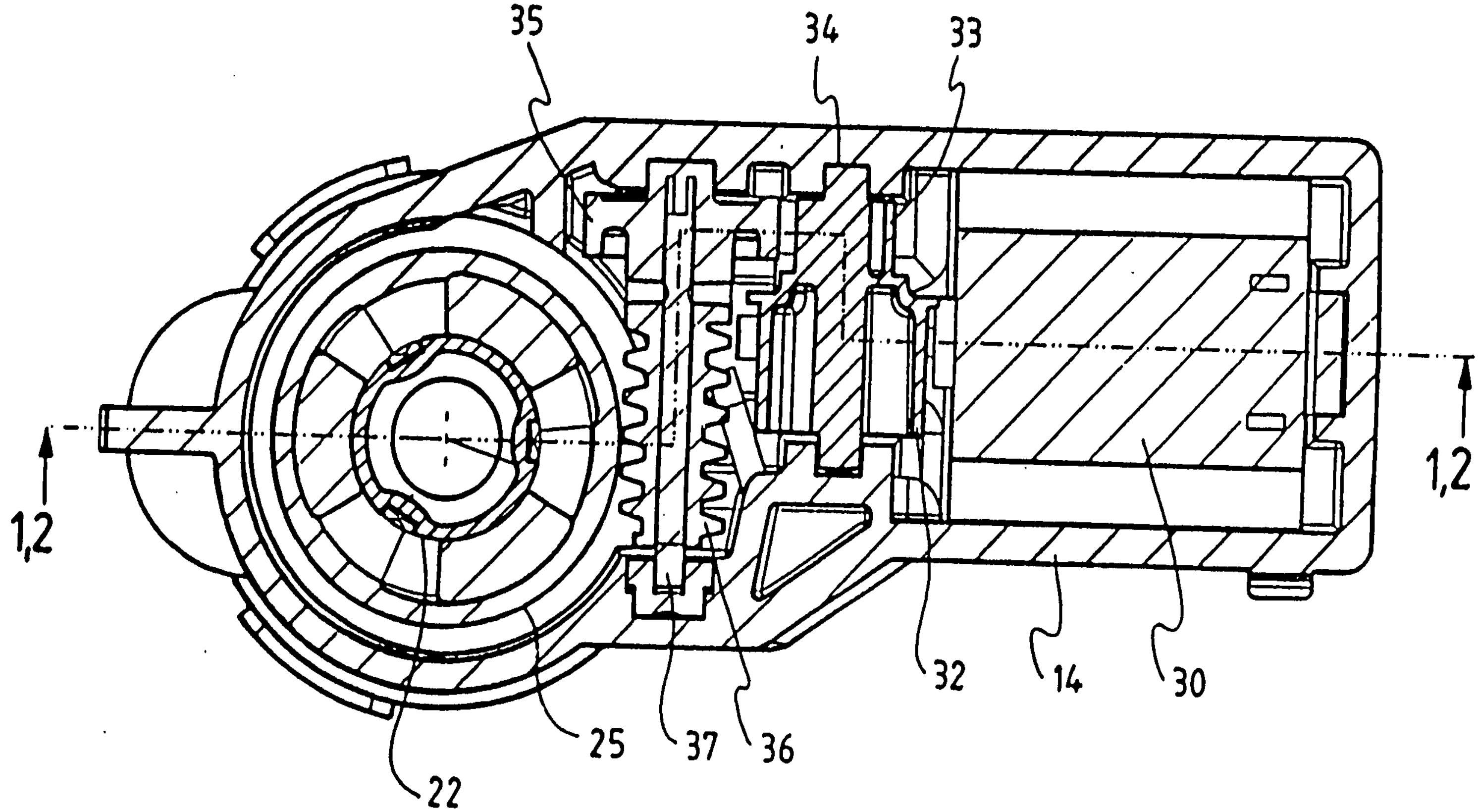

FIG. 3

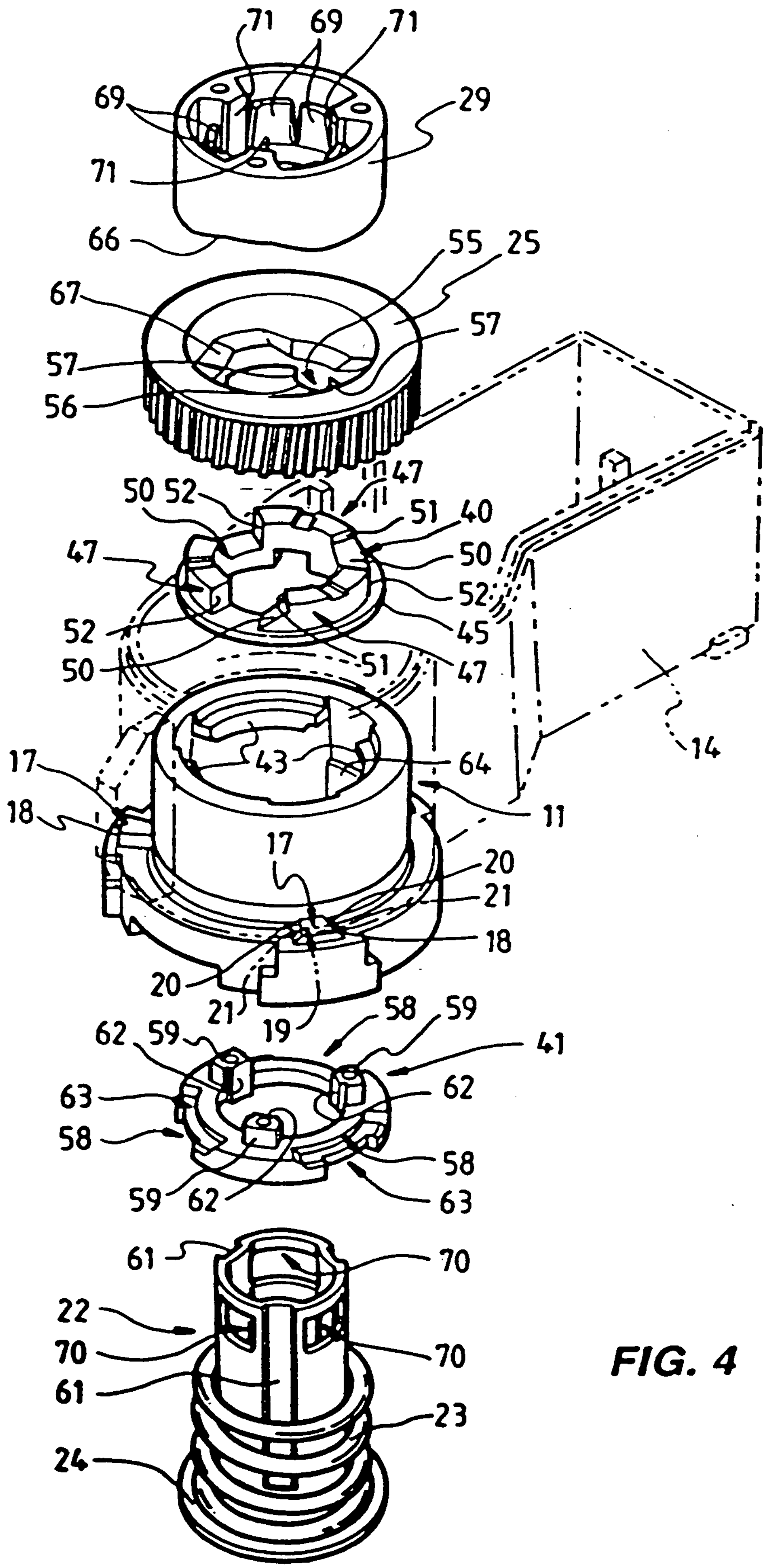
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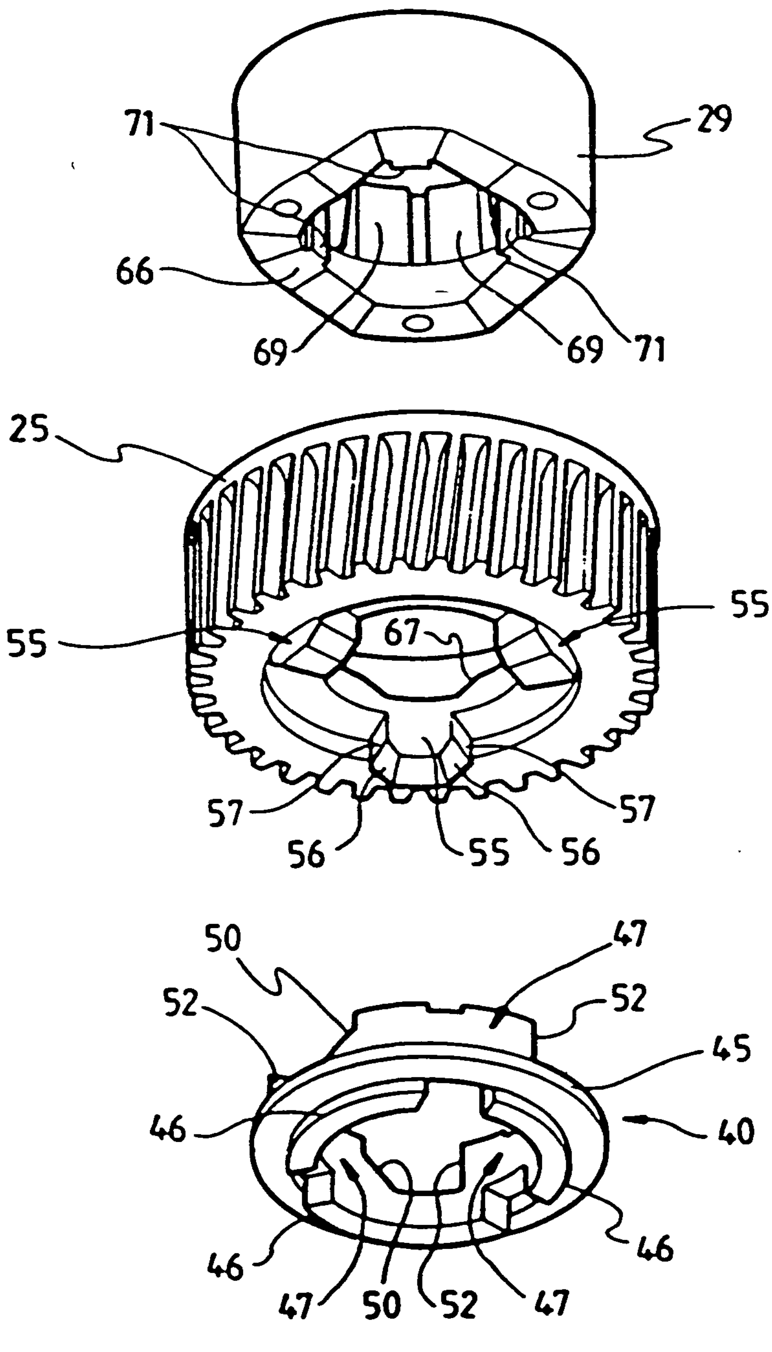
FIG. 4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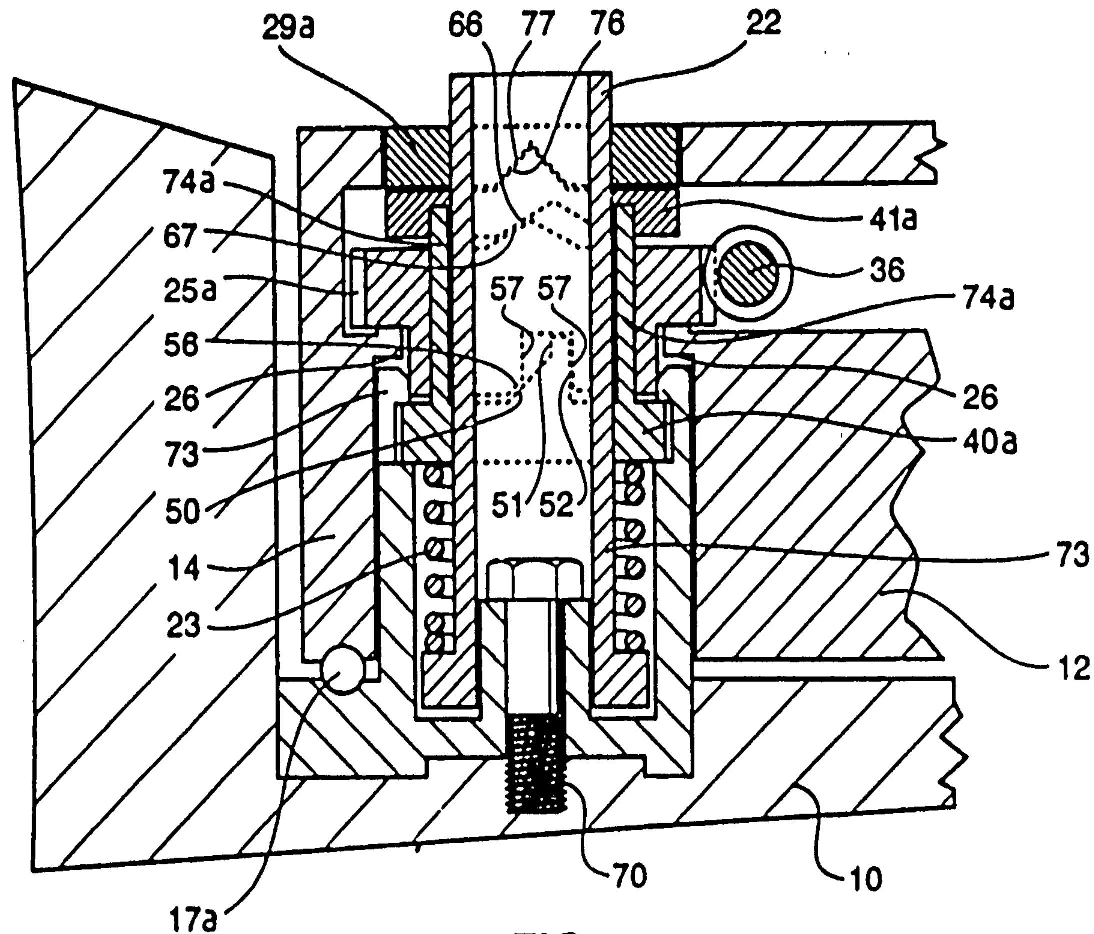
47

FIG. 5



29a
66
77
76
22
74a
67
25a
56
26
73
50
14
23
41a
36
74a
26
40a
73
12
57 57
51 52
70
10
17a

FIG 6

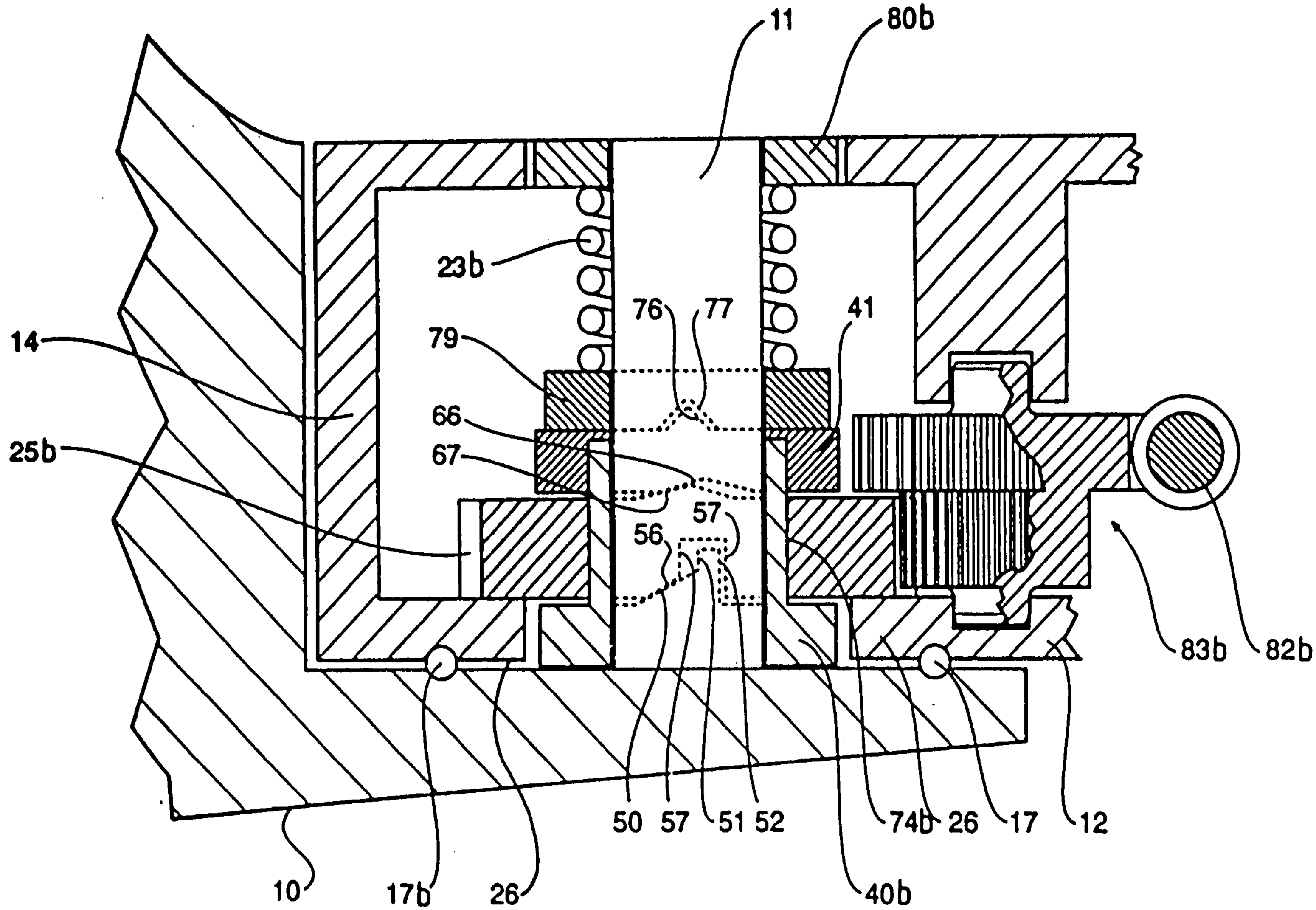
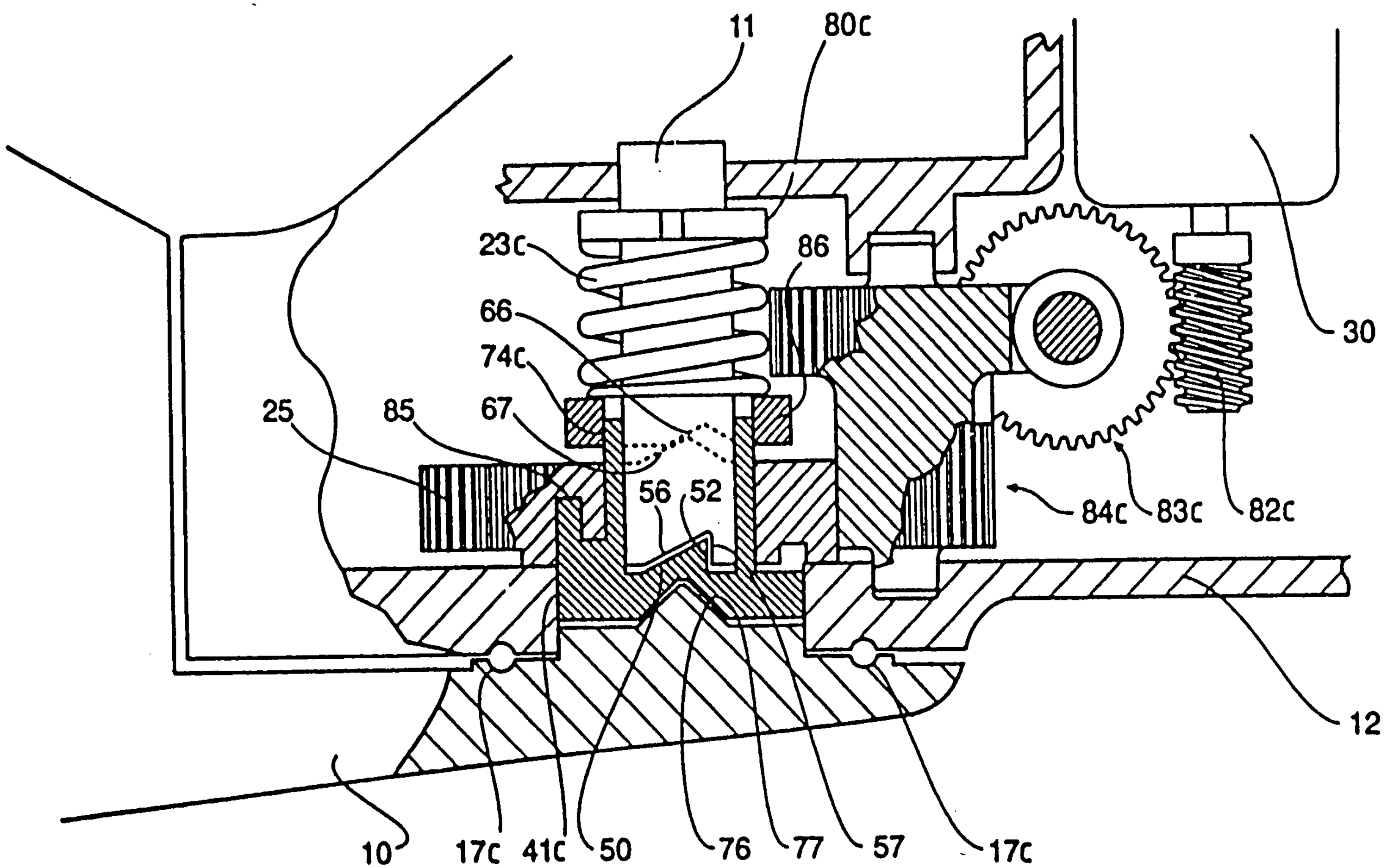

11
80b
23b
76
77
41
14
79
66
67
25b
57
56
83b
82b
10
17b
26
50
57
51
52
40b
74b
26
17
12

FIG 7



11
80c
23c
86
66
74c
25
85
67
56
52
30
84c
83c
82c
12
10
17c
41c
50
76
77
57
17c

FIG 8

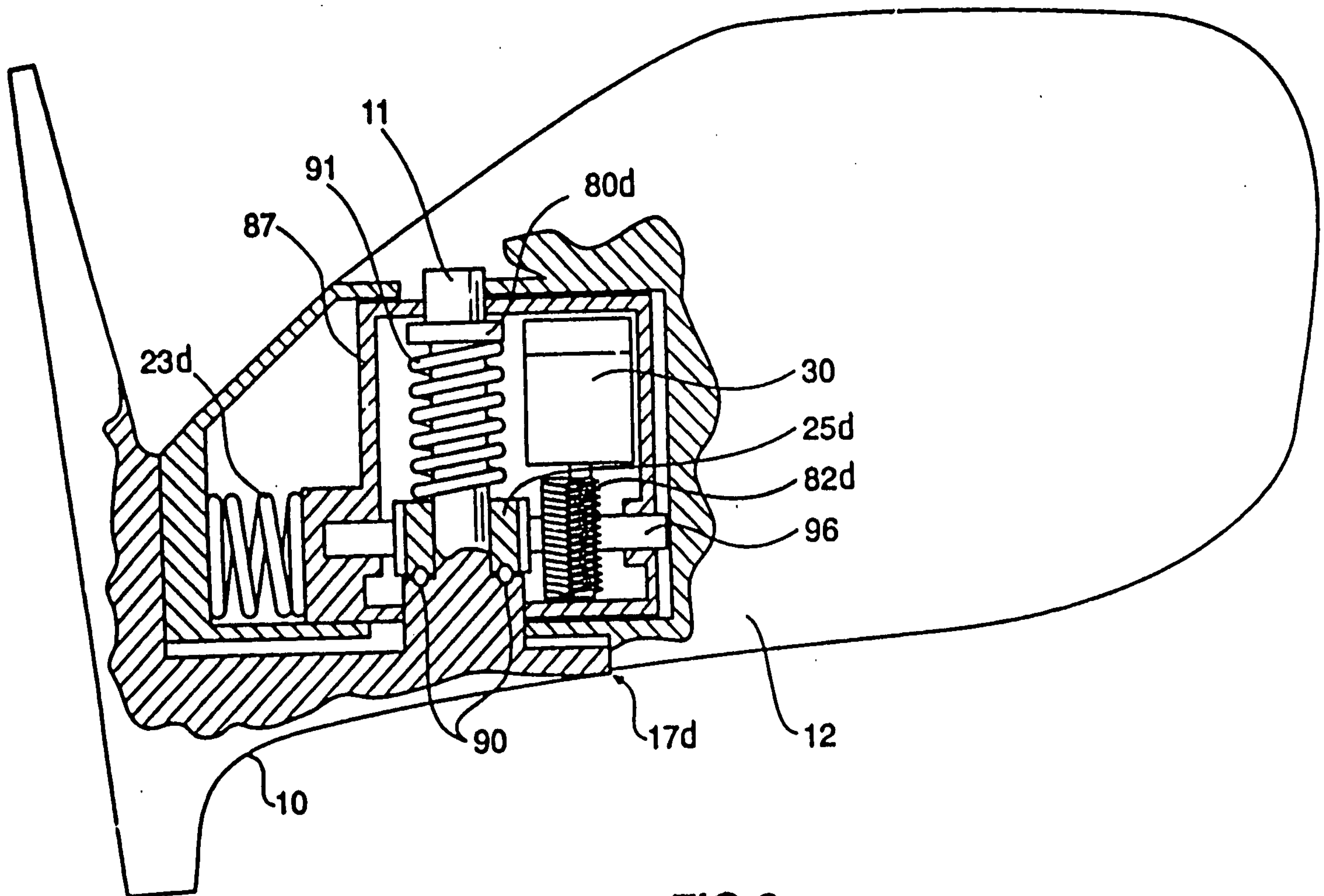


FIG.9

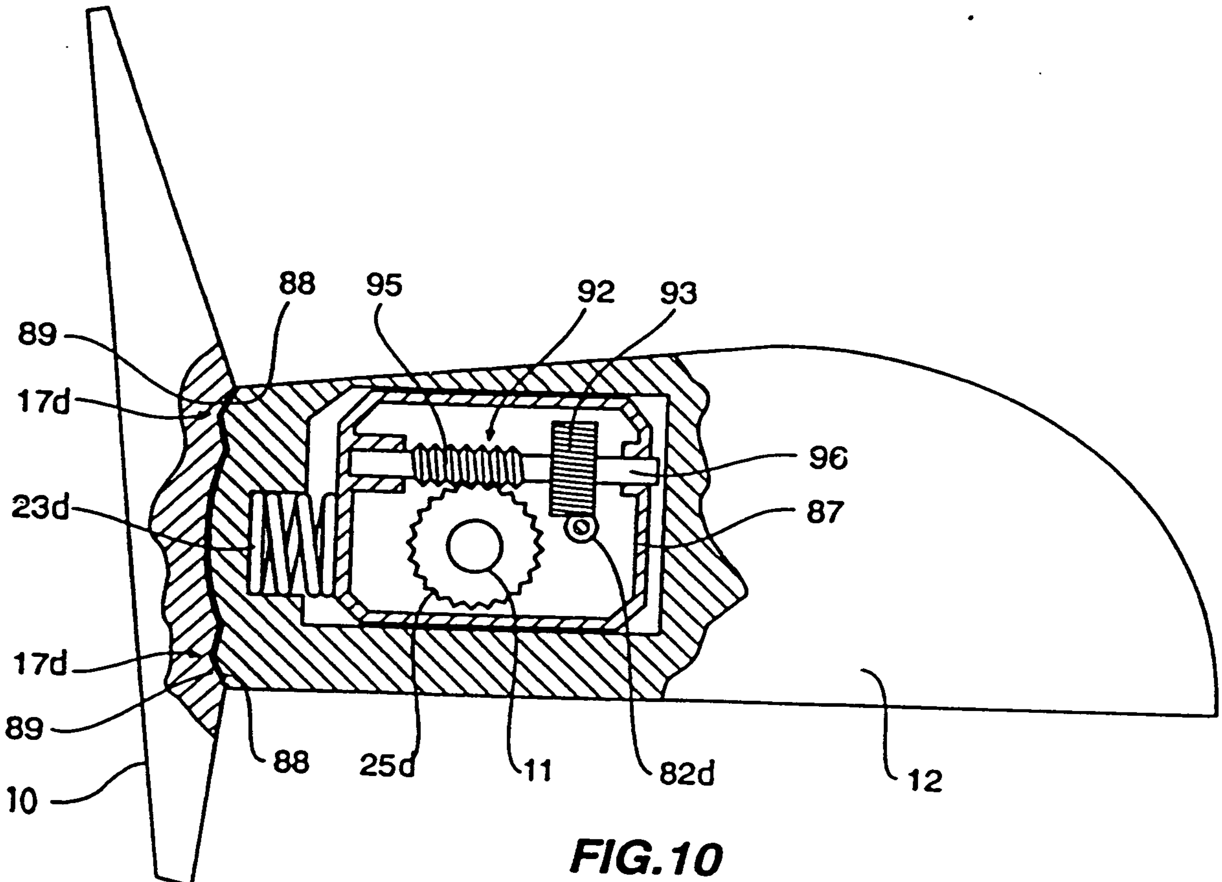

88
95
92
93
89
17d
96
23d
87
17d
89
88
25d
11
82d
12
10

FIG.10

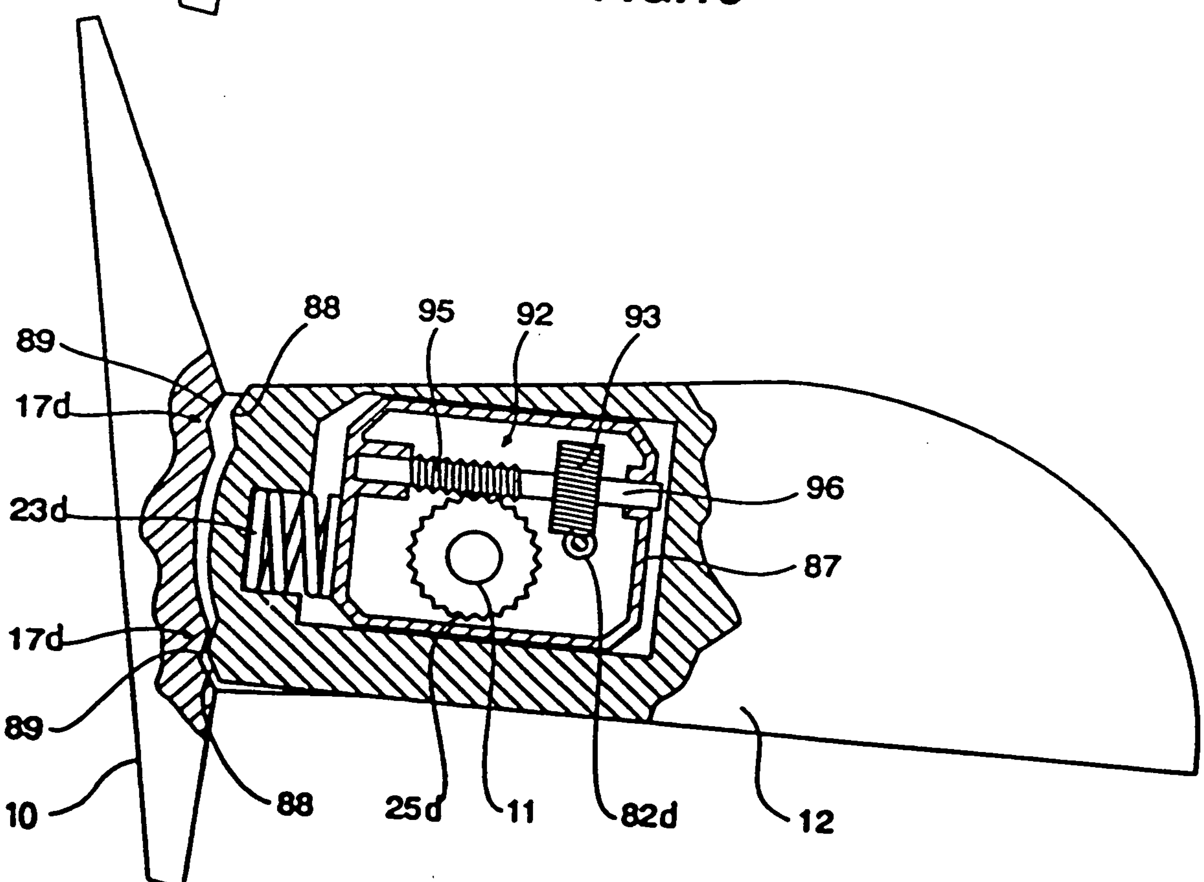

88
95
92
93
89
17d
96
23d
87
17d
89
88
25d
11
82d
12
10

FIG.11